HN

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/034,689	12/28/2001	Nanjunda Swamy Satish Jamadagni	1488.015US1	2343

21186 7590 04/22/2005

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402-0938

EXAMINER	
TRAN, MAI T	

ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 04/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/034,689	SATISH JAMADAGNI, NANJUNDA SWAMY	
	Examiner	Art Unit	
	Mai T. Tran	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/28/2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/28/2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is responsive to application 10/034689, filed December 28, 2001.

Claims **1-63** have been examined.

DRAWINGS

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "FCM fragments 166 in Figure 1". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to because of the minor informalities: the reference numbers in Figure 2 do not match with Applicant's specification on page 14, line 3 as: 'Bad' 210, 'Good' 220, and 'moderate' 230. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement

drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

SPECIFICATION

The disclosure is objected to because of the following informalities: on page 5, line 16, applicant states the present invention is "a for". The sentence is grammatically incorrect. On page 11, line 17, applicant describes an FCM is a "singed" directed graph. Examiner interprets as "a signed directed graph". On page 23, line 15, Figure 13 is mislabeled. The description of this figure belongs to Figure 11. On page 24, line 7, applicant describes the tail nodes are nodes with text "ipOutRoutes". Such text does not exist in Figure 14. Examiner finds tail

nodes with text ipOutNoRoutes instead. Appropriate correction is required. It should be noted that no patentable significance is drawn from these.

CLAIM OBJECTIONS

Claims **4, 27, 28 and 58** are objected to because of the following informalities:

In claim **4** and claim **28**, it appears from the specification that only one system exists. In claim **27** "to" in front of evaluate is missing. In claim **58,** applicant claims "the event-correlation system of 57". Examiner interprets as system of claim 57. Appropriate correction is required.

CLAIM REJECTIONS - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **6, 10, 30, 37, 46, and 50** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims **6, 30, 37 and 46**, applicant claims "hardware/software". Applicant needs to specify which.

In claims **10 and 50**, applicant claims static information associated with each class of managed "and/or" dynamic information that affects the causal propagation of events. Applicant needs to specify which.

CLAIM REJECTIONS - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims **1-18, 22-31, 33-39, 41-58, and 62-63** are rejected under 35 U.S.C. 102(b) as being anticipated by "Computational Intelligence for Distributed Fault Management in Networks Using Fuzzy Cognitive Maps", by Ndousse et al, hereinafter Ndousse.

Claim 1

A method to diagnose a problem from multiple events in a system of managed components generating real-time events of problems, comprising:

forming fuzzy cognitive maps (FCMs) including causally equivalent FCM fragments using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects (page 1559, left col., lines 36-37);

sampling generated incoming real-time events from the system (page 1558, left col., lines 5-8); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (page 1558, left col., line 20).

Claim 2

The method of claim 1, wherein forming the FCM fragments comprises:

determining event nodes from events in the database;

identifying concept nodes from the determined event nodes; and

forming FCM fragments including interdependencies between the concept and event nodes using the determined event nodes and the identified concept nodes (page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5).

Claim 3

The method of claim 2, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies;

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation; and

diagnosing the problems based on the outcome of the analysis (page 1559, Figure 2).

Claim 4

The method of claim 3, wherein the system comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (page 1558, title).

Claim 5

The method of claim 3, wherein the events comprise:

exceptional conditions occurring in the operation of the network (page 1558, left col., lines 32-33).

Claim 6

The method of claim 5, wherein the event nodes comprise:

significant events selected from the group consisting of hardware/software failures, performance bottlenecks, configuration problems, and security violations (page 1558, left col., lines 32-33).

Claim 7

The method of claim 6, wherein determining the event nodes comprises:

determining the event nodes from a database defining the network managed objects and event notifications that convey the state of one or more managed objects. Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device.

Claim 8

The method of claim 7, wherein determining the event nodes further comprises:

determining the event nodes from expert knowledge of the network (page 1559, left col., lines 1-3).

Claim 9

The method of claim 8, wherein the managed objects comprise:

objects selected from the group consisting of network objects, attached systems, and application objects (page 1558, right col., line 10).

Claim 10

The method of claim 8, wherein the database comprises:

static information associated with each class of managed and/or dynamic information that affects the causal propagation of events (page 1558, right col., last 2 lines). Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device.

Claim 11

The method of claim 3, wherein sampling the incoming real-time events comprises:

sampling the incoming real-time events sequentially in the order they are received (page 1558, left col., lines 5-8).

Claim 12

The method of claim 3, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (page 1560, Figure 5).

Claim 13

The method of claim 12, wherein the abstract exception condition comprises:

abstract exception conditions selected from the group consisting of a notion of fault and a notion of performance degradation, a network card in a communication system being faulty with the number of users being served by the

communication system drastically reducing, and link between two routers going down leading to the use of alternate paths which lead to congestion and performance (page 1561, left col., lines 10-11, 14, right col., lines 1-3).

Claim 14

The method of claim 12, wherein capturing the abstract exception condition comprises:

capturing normal paths based on predetermined criteria on which the events have to be diagnosed (page 1558, left col., lines 6-10).

Claim 15

The method of claim 14, wherein the criteria comprises:

causal and temporal inconsistencies between events (page 1558, left col., lines 6-10).

Claim 16

The method of claim 1, wherein forming the FCM, comprises:

capturing system event interdependencies (page 1559, left col., lines 36-40).

Claim 17

The method of claim 15, wherein capturing the system event interdependencies comprises:

interconnecting event and concept nodes using interdependency arcs capturing temporal and logical dependencies (page 1559, left col., lines 36-40).

Claim 18

The method of claim 17, wherein the interdependency arcs comprise:

weights based on temporal and logical dependencies (page 1559, left col., lines 42-45).

Claim 22

A method for diagnosing problems from multiple events in a communication network including managed components generating real-time events of problems, comprising:

forming fuzzy cognitive maps (FCMs) including causally equivalent FCM fragments using network element interdependencies (page 1559, left col., lines 36-37);

sampling generated incoming real-time events from the network (page 1558, left col., lines 5-8); and

diagnosing each of the generated problems by mapping the received sampled events to the formed FCM fragments (page 1558, left col., line 20).

Claim 23

The method of claim 22, wherein forming the FCM fragments comprises:

determining event nodes from events in the database;

identifying concept nodes from the determined event nodes; and

forming FCM fragments including interdependencies between the concept and event nodes using the determined event nodes and the identified concept nodes (page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5).

Claim 24

The method of claim 23, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies;

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation; and

diagnosing the problems based on the outcome of the analysis (page 1559, Figure 2).

Claim 25

A computer readable medium having computer-executable instructions to diagnose problems from multiple events in a system of managed components generating real-time events of problems, comprising (page 1562, right col., lines 18-21):

forming fuzzy cognitive maps (FCMs) including causally equivalent FCM fragments using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects (page 1559, left col., lines 36-37);

sampling generated incoming real-time events from the system (page 1558, left col., lines 5-8); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (page 1558, left col., line 20).

Claim 26

The computer readable medium of claim 25, wherein forming the FCM fragments comprises:

determining event nodes from events in the database;

identifying concept nodes from the determined event nodes; and

forming FCM fragments including interdependencies between the concept and event nodes using the determined event nodes and the identified concept nodes (page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5).

Claim 27

The computer readable medium of claim 26, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies;

identifying the problems by analyzing the concept nodes based on activation levels of the concept nodes; and

diagnosing the problems based on the outcome of the analysis (page 1559, Figure 2).

Claim 28

The computer readable medium of claim 27, wherein the system comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (page 1558, title).

Claim 29

The computer readable medium of claim 28, wherein the events comprise:

exceptional conditions occurring in the operation of the network (page 1558, left col., lines 32-33).

Claim 30

The computer readable medium of claim 29, wherein the event nodes comprise:

significant events selected from the group consisting of hardware/software failures, performance bottlenecks, configuration problems, and security violations (page 1558, left col., lines 32-33).

Claim 31

The computer readable medium of claim 27, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (page 1560, Figure 5).

Claim 33

A computer system to diagnose problems from multiple events in a system of managed components generating real-time events of problems, comprising:

a storage device;

an output device; and

a processor programmed to repeatedly perform a method, comprising (page 1562, right col., lines 18-21). Software is run on a computer system. Official notice is taken that a computer comprises a storage device, an output device, and a processor:

forming fuzzy cognitive maps (FCMs) including causally equivalent FCM fragments using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects (page 1559, left col., lines 36-37);

sampling generated incoming real-time events from the system (page 1558, left col., lines 5-8); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (page 1558, left col., line 20).

Claim 34

The system of claim 33, wherein forming the FCM fragments comprises:

determining event nodes from events in the database;

identifying concept nodes from the determined event nodes; and

forming FCM fragments including interdependencies between the concept and event nodes using the determined event nodes and the identified concept nodes (page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5).

Claim 35

The system of claim 34, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies;

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation; and

diagnosing the problems based on the outcome of the analysis (page 1559, Figure 2).

Claim 36

The system of claim 35, wherein the events comprise:

exceptional conditions occurring in the operation of the network (page 1558, left col., lines 32-33).

Claim 37

The system of claim 35, wherein the event nodes comprise:

significant events selected from the group consisting of hardware/software failures, performance bottlenecks, configuration problems, and security violations (page 1558, left col., lines 32-33).

Claim 38

The system of claim 35, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (page 1560, Figure 5).

Claim 39

The system of claim 35, wherein forming the FCM, comprises:

capturing system event interdependencies by interconnecting event and concept nodes using interdependency arcs that capture temporal and logical dependencies (page 1559, left col., lines 36-40).

Claim 41

An event-correlation system to diagnose problems from multiple incoming real-time events in a communication network of managed components generating real-time events of problems, comprising:

an event-analyzer to form fuzzy cognitive maps (FCM) fragments using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects (page 1559, left col., lines 36-37); and

an event-processing module coupled to the event-analyzer to sample generated incoming real-time events from the network (page 1558, left col., lines 5-8), wherein the analyzer to diagnose the problems from the sampled events by mapping the sampled events to the formed FCM fragments (page 1558, left col., line 20).

Claim 42

The event-correlation system of claim 41, wherein the analyzer forms FCM fragments by determining event nodes from events in the database, and by further identifying concept nodes from the determined event nodes to form FCM fragments including interdependencies between the identified concept nodes and the determined event nodes (page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5).

Claim 43

The event-correlation system of claim 41, wherein the analyzer further maps the sampled events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped events on the determined

concept nodes using the determined interdependencies, wherein the analyzer identifies the problems by analyzing the concept nodes based on the outcome of the evaluation and further diagnoses the problems based on the outcome of the analysis (page 1559, Figure 2).

Claim 44

The event-correlation system of claim 43, wherein the communication network comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (page 1558, title).

Claim 45

The event-correlation system of claim 43, wherein the events comprise:

exceptional conditions occurring in the operation of the network (page 1558, left col., lines 32-33).

Claim 46

The event-correlation system of claim 45, wherein the event nodes comprise:

significant events selected from the group consisting of hardware/software failures, performance bottlenecks, configuration problems, and security violations (page 1558, left col., lines 32-33).

Claim 47

The event-correlation system of claim 46, wherein the analyzer determines the event nodes from a database defining the network managed-objects and event

notifications that convey the state of one or more managed objects. Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device.

Claim 48

The event-correlation system of claim 47, wherein the analyzer determines the event nodes from expert knowledge of the network (page 1559, left col., lines 1-3).

Claim 49

The event-correlation system of claim 48, wherein the managed objects comprise:

objects selected from the group consisting of network objects, attached systems, and application objects (page 1558, right col., line 10).

Claim 50

The event-correlation system of claim 48, wherein the database comprises:

static information associated with each class of managed objects and/or dynamic information that affects the casual propagation of events (page 1558, right col., last 2 lines). Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device.

Claim 51

The event-correlation system of claim 43, further comprising:

a communication interface module coupled between the network and the event-processing module to extract events from real-time messages received in different formats from the network and to further sample the extracted events sequentially in the order they are received (page 1558, left col., lines 5-8).

Claim 52

The event-correlation system of claim 43, wherein the analyzer identifying the concept nodes comprises a composite set of events that capture a notion of an abstract exception condition in the network (page 1560, Figure 5).

Claim 53

The event-correlation system of claim 52, wherein the abstract exception condition comprises conditions selected from the group consisting of a notion of fault and a notion of performance degradation (page 1561, left col., lines 10-11, 14, right col., lines 1-3).

Claim 54

The event-correlation system of claim 52, wherein the analyzer captures the abstract exception condition by capturing normal paths based on predetermined criteria from which for the events are diagnosed (page 1558, left col., lines 6-10).

Claim 55

The event-correlation system of claim 54, wherein the criteria comprises:

causal and temporal inconsistencies between events (page 1558, left col., lines 6-10).

Claim 56

The event-correlation system of claim 43, wherein the analyzer forms FCM by capturing system event interdependencies (page 1559, left col., lines 36-40).

Claim 57

The event-correlation system of claim 56, wherein the analyzer captures system interdependencies by interconnecting event and concept nodes using interdependency arcs to capture temporal and logical dependencies (page 1559, left col., lines 36-40).

Claim 58

The event-correlation system of claim 57, wherein the interdependency arcs comprise:

weights based on temporal and logical dependencies (page 1559, left col., lines 42-45).

Claim 62

The event-correlation system of claim 43, further comprising:

an interface output module coupled to the event-analyzer to output one or more solutions based on the outcome of diagnosing the problems by the analyzer (page 1562, right col., lines 18-21). Software is run on a computer system. Official notice is taken that a computer comprises a storage device, an output device, and a processor.

Claim 63

The event-correlation system of claim 62, further comprising:

a memory to store the static and dynamic information. Official notice is taken that a computer comprises a memory.

CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims **19-21, 32, 40, and 59-61** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ndousse as applied to claims 1-18, 22-31, 33-39, 41-58, and 62-63 above, in view of "Contextual Fuzzy Cognitive Map for Decision Support in Geographic Information Systems" by Zhi-Qiang Liu et al, hereinafter Liu, and further in view of "Cognitive maps and fuzzy implications" by Thierry Marchant, hereinafter Marchant.

Claim 19

Ndousse discloses substantially all of applicant's claimed invention with the exception of the computation of an indirect effect of events. Liu teaches the computation of an indirect effect on concepts in an FCM using the claimed equation. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Ndousse as taught by Liu for the purpose of decision support based on the degree to which one concept affects another.

Liu does not expressly disclose the computation of the bounded difference. Marchant teaches the computation of the bounded difference using the claimed equation which is the fuzzy equivalents of the AND logical connective of two sets. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Ndousse and Liu as taught by Marchant in order to find what are the elements of a system on which we eventually could act in order to modify the system based on the bound and domain.

The method of claim 3, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events (predictive event-correlation) on concept nodes using the equations:

$$I_{px}(E_i, C_j) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r_1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_{r_n}}(E_{km}, C_j))$$

wherein the indirect effect of events E_i on concept nodes C_i can be defined as the intersection of the linked causal types and can be described by the above

equation, e_{px} is a function which takes I_{ij} to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions μ_A and μ_B.

Claim 20

The method of claim 19, wherein mapping the received real-time events to the formed FCM fragments comprises:

correlating the received events to the identified concept nodes to evaluate the effect of the received event nodes on the identified concept nodes using the determined element interdependencies (page 1559, Figure 2).

Claim 21

The method of claim 20, wherein correlating the received events to the concept nodes further comprises:

accumulating evidence based on the received event nodes;

comparing the accumulated evidence to a threshold value; and

analyzing the concept nodes based on the outcome of the comparing to evaluate the effect of the received event nodes (page 1559, right col.)

Claim 32

The computer readable medium of claim 27, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events on concept nodes using the equation:

$$I_{px}(E_i, C_j) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_{rn}}(E_{km}, C_j))$$

wherein the indirect effect of events E_i on concept nodes C_i can be defined as the intersection of the linked causal types and can be described by the above equation, e_{px} is a function which takes I_{ij} to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions μ_A and μ_B.

Claim 40

The system of claim 35, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events on concept nodes using the equation:

$$I_{px}(E_i, C_j) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_{rn}}(E_{km}, C_j))$$

wherein the indirect effect of events E_i on concept nodes C_i can be defined as the intersection of the linked causal types and can be described by the above equation, e_{px} is a function which takes I_{ij} to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions μ_A and μ_B.

Claim 59

The event-correlation system of claim 43, wherein the analyzer evaluates an indirect effect of events on concept nodes using the equations:

$$I_{px}(E_i, C_j) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_{rn}}(E_{kn}, C_j))$$

wherein the indirect effect of events E_i on concept nodes C_i can be defined as the intersection of the linked causal types and can be described by the above equation, e_{px} is a function which takes I_{ij} to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions μ_A and μ_B.

Claim 60

The event-correlation system of claim 59, wherein the analyzer maps the received real-time events to the formed FCM fragments by correlating the received events to the identified concept nodes to evaluate the effect of the received event nodes on the identified concept nodes using the determined element interdependencies (page 1559, Figure 2).

Claim 61

The event-correlation system of claim 59, wherein the analyzer correlates the received events by accumulating evidence based on the received event nodes and compares the accumulated evidence to a threshold value, and analyzes the concept nodes based on the outcome of the comparing to evaluate the effect of the received event nodes (page 1559, right col.)

CONCLUSION

The following is prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

1. Whitney, Christopher, U. S. Patent No. 5,646,864.
2. Grace, Andrew, U. S. Patent No. 5,748,098.
3. Yemini et al, U. S. Patent No. 5,528,516.
4. Yemini et al, U. S. Patent No. 5,661,668.

5. Yemini et al, U. S. Patent No. 6,249,755.
6. Fuzzy Engineering, Bart Kosko, Prentice Hall, 1997 (Book).
7. "Fuzzy Temporal Reasoning Model for Event Correlation in Network Management", Emad Aboelela and Christos Douligeris, Local Computer Networks, 1999. LCN '99. Conference on 18-20 Oct. 1999, Pages 150– 159.
8. "Rule based fuzzy cognitive maps and fuzzy cognitive maps-a comparative study", Carvalho, J.P.; Tome, J.A.B.; Fuzzy Information Processing Society, 1999. NAFIPS. 18th International Conference of the North American, 10-12 June 1999, Pages 115-119.
9. "Fuzzy cognitive maps over possible worlds", Silva, P.C.; Fuzzy Systems, 1995. International Joint Conference of the Fourth IEEE International Conference on Fuzzy Systems and The Second International Fuzzy Engineering Symposium., Proceedings of 1995 IEEE International Conference on , Volume: 2 , 20-24 March 1995, Pages 555 - 560 vol.2.
10. "A contextual fuzzy cognitive map framework for geographic information systems", Satur, R.; Zhi-Qiang Liu; Fuzzy Systems, IEEE Transactions on, Volume: 7, Issue: 5, Oct. 1999, Pages 481 – 494.
11. "On causal inference in fuzzy cognitive maps", Yuan Miao; Zhi-Qiang Liu; Fuzzy Systems, IEEE Transactions on, Volume: 8, Issue: 1, Feb. 2000, Pages 107 – 119.
12. "A Temporal Reasoning and Abstraction Framework for Model-Based Diagnosis Systems", by Johann Gamper, PhD Report, 12-07-1996.

13. "Introducing the theory of fuzzy cognitive maps in distributed systems", Stylios, C.D.; Georgopoulos, V.C.; Groumpos, P.P.; Intelligent Control, 1997. Proceedings of the 1997 IEEE International Symposium on, 16-18 July 1997, Pages 55 – 60.

14. Data Communication Networks, Information Technology, Open Systems Interconnection, Structure of Management, Information: Guidelines for the Definition of Managed Objects, CCITT X.722, Geneva 1992.

15. "Fuzzy object-oriented system design", W. Pedrycz, Z. A. Sosnowski, Fuzzy Sets and Systems, Volume 99, Issue 2 (October 1998), Pages 121 – 134.

CORRESPONDENCE INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571) 272-4238. The examiner can normally be reached on M-F 9:00am--5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on (571) 272-3687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M.T.T
Patent Examiner
Date: 3/4/2005

Anthony Knight
Supervisory Patent Examiner
Tech Center 2100